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**PATENT**

## **Shoe with Support Element**

### **Summary Of The Invention**

In general, a shoe of the present invention comprises a midsole, an outsole, an  
5 upper, a closure system and a sole stiffening member. The midsole has a midsole  
bottom surface, a midsole top surface, and midsole medial and lateral side surfaces  
extending up from the midsole bottom surface. The outsole has an outsole forefoot  
portion and an outsole heel portion. The outsole forefoot portion is adjacent the midsole  
bottom surface and the outsole heel portion is adjacent the midsole bottom surface.  
10 The upper extends up from the midsole and has an upper heel portion, an upper medial  
portion and an upper lateral portion. The upper heel portion is laterally between the

upper medial portion and the upper lateral portion. The closure system has a medial closure portion operatively connected to the upper medial portion and a lateral closure portion operatively connected to the upper lateral portion. The closure system is adapted for movement between a tensioned condition and a loosened condition. The

5 tensioned condition is a condition in which the closure system maintains the medial closure portion a tightened distance from the lateral closure portion. The loosened condition is a condition in which the closure system maintains the medial closure portion a loosened distance from the lateral closure portion. The loosened distance is greater than the tightened distance. The sole stiffening member has a connecting portion, a

10 forefoot engageable portion, a heel engageable portion, a medial wing portion having a medial wing distal tip portion, and a lateral wing portion having a lateral wing distal tip portion. The forefoot engageable portion extends generally forward from the connecting portion. The heel engageable portion extends generally rearward from the connecting portion. The medial wing portion extends generally medially from the connecting

15 portion. The lateral wing portion extends generally laterally from the connecting portion. The forefoot engageable portion is secured to the midsole bottom surface and the heel engageable portion is secured to the midsole bottom surface. The medial and lateral wing portions are positioned such that at least a portion of a straight line segment extending from the medial distal tip portion to the lateral distal tip portion is spaced over

20 at least a portion of the midsole top surface. The portion of the midsole top surface is between the portion of the line segment and a portion of the midsole bottom surface. The sole stiffening member is adapted to provide increased support in a shank area of the shoe.

Another aspect of the invention is a shoe comprising a midsole, an outsole, an upper and a sole stiffening member. The midsole has a midsole bottom surface, a midsole top surface, and midsole medial and lateral side surfaces extending up from the midsole bottom surface. The outsole has an outsole forefoot portion and an outsole heel portion. The outsole forefoot portion is adjacent the midsole bottom surface and the outsole heel portion is adjacent the midsole bottom surface. The upper extends up from the midsole and has an upper heel portion, an upper medial portion and an upper lateral portion. The upper heel portion is laterally between the upper medial portion and the upper lateral portion. The sole stiffening member has a connecting portion, a forefoot engageable portion, a heel engageable portion, a medial wing portion having a medial wing distal tip portion, and a lateral wing portion having a lateral wing distal tip portion. The forefoot engageable portion extends generally forward from the connecting portion. The heel engageable portion extends generally rearward from the connecting portion. The medial wing portion extends generally medially from the connecting portion. The lateral wing portion extends generally laterally from the connecting portion. The forefoot engageable portion is secured to the outsole forefoot portion and the heel engageable portion is secured to the outsole heel portion. The medial and lateral wing portions are positioned such that at least a portion of a straight line segment extending from the medial distal tip portion to the lateral distal tip portion is spaced over at least a portion of the midsole top surface. The portion of the midsole top surface is between the portion of the line segment and a portion of the midsole bottom surface. The sole stiffening member is adapted to provide increased support in a shank area of the shoe.

In another aspect of the invention, a shoe comprises a midsole, an outsole, an upper and a sole stiffening member. The midsole has a midsole bottom surface, a midsole top surface, and midsole medial and lateral side surfaces extending up from the midsole bottom surface. The outsole has an outsole forefoot portion and an outsole heel portion. The outsole forefoot portion is adjacent the midsole bottom surface and the outsole heel portion is adjacent the midsole bottom surface. The upper extends up from the midsole and has an upper heel portion, an upper medial portion and an upper lateral portion. The upper heel portion is laterally between the upper medial portion and the upper lateral portion. The sole stiffening member has a connecting portion, a forefoot engageable portion, a heel engageable portion, a medial wing portion having a medial wing distal tip portion, and a lateral wing portion having a lateral wing distal tip portion. The forefoot engageable portion extends generally forward from the connecting portion. The heel engageable portion extends generally rearward from the connecting portion. The medial wing portion extends generally medially from the connecting portion. The lateral wing portion extends generally laterally from the connecting portion. The forefoot engageable portion is secured to the outsole forefoot portion and the heel engageable portion is secured to the outsole heel portion. The medial and lateral wing portions are positioned such that at least a portion of a straight line segment extending from the medial distal tip portion to the lateral distal tip portion is spaced over at least a portion of the midsole top surface. The portion of the midsole top surface is between the portion of the line segment and a portion of the midsole bottom surface. The sole stiffening member is adapted to interact with the midsole such that a portion of the

midsole bottom surface adjacent the sole stiffening member is compressed as the shoe bends during use.

Other features and advantages will be in part apparent and in part pointed out hereinafter.

## 5 **Brief Description Of The Drawings**

Fig. 1 is a side elevation view of a shoe of the present invention, the shoe having a securing system and a sole stiffening member;

Fig. 2 is a bottom plan view of the shoe of Fig. 1;

Fig. 3 is a fragmented, cross-sectional view taken along the plane of line 3-3 of

10 Fig. 2;

Fig. 4 is a top plan view of the shoe of Fig. 1 in a first condition;

Fig. 5 is top plan view of the shoe of Fig. 1 in a second condition;

Fig. 6 is a rear elevation view of the shoe of Fig. 1;

Fig. 7 is a perspective view of the securing system and the sole stiffening

15 member of Fig. 1;

Fig. 8 is a perspective view of the sole stiffening member of Fig. 7;

Fig. 9 is a fragmented, cross-sectional view taken along line the plane of line 9-9 of Fig. 2; and

Fig. 10 is a perspective view of another securing system and sole stiffening

20 member of the present invention.

Corresponding reference characters indicate corresponding parts throughout the several views of the drawings.

### **Detailed Description Of The Preferred Embodiments**

Referring now to the drawings, and more particularly to Figs. 1 and 2, a shoe of the present invention is indicated in its entirety by the reference numeral 20. The shoe comprises a midsole generally indicated at 22, an outsole generally indicated at 24, an upper generally indicated at 26, a sole stiffening member 28, a securing system 30, and a closure system generally indicated at 32.

As shown in Fig. 3 the midsole includes a midsole top surface 36, a midsole bottom surface 38, a midsole medial side surface 40, and a midsole lateral side surface 42. The midsole medial and lateral side surfaces extend up from the midsole bottom surface. For purposes of clarity, no additional shoe structure (i.e. sock liner) has been presented in the drawings. Of course, the shoe set forth in the drawings may include such additional shoe structure.

The outsole shown in Fig. 2 includes an outsole forefoot portion 44 and an outsole heel portion 46. The outsole forefoot portion is adjacent to and operatively connected to a portion of the midsole bottom surface. The outsole heel portion is adjacent to and operatively connected to another portion of the midsole bottom surface.

The upper (Figs. 4-6) extends up from and is operatively connected to the midsole. The upper includes an upper medial portion generally indicated at 48, an upper lateral portion generally indicated at 50, and an upper heel portion generally indicated at 52. The upper heel portion is laterally between the upper lateral and medial portions. The upper can also include a tongue. The upper and midsole are shaped and adapted to receive a wearer's foot.

In Figs. 4 and 5, the closure system generally indicated at 32 interacts with the upper to allow the wearer to insert a foot into the shoe and to subsequently tighten the shoe about the wearer's foot to reduce the relative movement of the shoe to the wearer's foot. The closure system has a medial closure portion generally indicated at 54 and a lateral closure portion generally indicated at 56. The medial closure portion is operatively connected to the upper medial portion and the lateral closure portion is operatively connected to the upper lateral portion. In the embodiment shown, the closure system includes a shoelace 58 laced through a plurality of eyelets on the upper medial portion 48 to comprise the medial closure portion 54 and the shoelace is laced through a plurality of eyelets on the upper lateral portion 50 to comprise the lateral closure portion 56. The closure system is adapted for movement between a tensioned condition and a loosened condition. The tensioned condition is a condition in which the closure system maintains the medial closure portion 54 a tightened distance  $d_T$  (as shown in Fig. 4) from the lateral closure portion 56. The loosened condition is a condition in which the closure system maintains the medial closure portion 54 a loosened distance  $d_L$  (as shown in Fig. 5) from the lateral closure portion 56. The loosened and tightened distances are variable depending upon the dimensions of the wearer's foot, but in all cases the loosened distance is greater than the tightened distance. Although the closure system is shown to be a shoelace and corresponding eyelets, it should be understood that any type of closure system could be used.

The sole stiffening member indicated generally in Fig. 7 and indicated in its entirety in Fig. 8 by reference numeral 28, has a connecting portion indicated generally at 60, a forefoot engageable portion indicated generally at 62, a heel engageable

portion indicated generally at 64, a lateral wing portion 66 extending laterally from the connecting portion, and a medial wing portion 68 extending medially from the connecting portion. The forefoot engageable portion 62 is downwardly offset and extends generally forward from the connecting portion 60. The forefoot engageable portion 62 includes a medial tab 70 extending medially and a lateral tab 72 extending laterally. The forefoot engageable portion 62 is secured between a portion of the outsole forefoot portion 44 and a portion of the midsole bottom surface 38.

As shown in Fig. 9, the heel engageable portion 64 is secured to the midsole bottom surface 38. The heel engageable portion 64 is downwardly offset and extends generally rearward from the connecting portion 60. The heel engageable portion 64 is sandwiched between a portion of the outsole heel portion 46 and a portion of the midsole bottom surface 38. The forefoot engageable portion 62 is sandwiched between a portion of the outsole forefoot portion 44 and a portion of the midsole bottom surface 38.

Referring to Fig. 3, the medial wing portion 68 has a medial distal tip portion 74 and the lateral wing portion 66 has a lateral distal tip portion 76. The medial and lateral wing portions are positioned such that a phantom line X can be formed through the medial and lateral distal tip portions 74 and 76. Phantom line X includes a straight line segment  $X_s$  between the medial and lateral distal tip portions 74 and 76. At least a portion of straight line segment  $X_s$  is spaced over at least a portion of the midsole top surface 36. The portion of the midsole top surface is between the portion of the line segment  $X_s$  and a portion of the midsole bottom surface 38. The sole stiffening member is made of a resilient material having a relative hardness greater than the upper. In the



embodiment shown, the sole stiffening member is made of thermoplastic polyurethane (TPU).

The securing system 30 shown in Fig. 7 is adapted to assist the closure system in reducing the amount of relative movement between the shoe and a wearer's foot.

- 5 The securing system has a heel securing portion generally indicated at 80, a medial instep securing portion 82, a lateral instep securing portion 84, a medial attaching portion 86, and a lateral attaching portion 88. The heel securing portion 80 is adjacent the upper heel portion 52. The medial instep securing portion 82 extends generally forward from the heel securing portion 80 and is operatively connected to the medial
- 10 closure portion 54 of the closure system. The lateral instep securing portion 84 extends generally forward from the heel securing portion 80 and is operatively connected to the lateral closure portion 56 of the closure system. The medial instep securing portion 82 includes a medial instep opening 90. The medial instep opening may be aligned with one of the plurality of eyelets on the medial closure portion 54 of the closure system.
- 15 Similarly, the lateral instep securing portion 84 includes a lateral instep opening 92. The lateral instep opening may be aligned with one of the plurality of eyelets on the lateral closure portion 54 of the closure system. The medial attaching portion 86 extends generally downward from the heel securing portion 80 and the medial instep securing portion 82. The lateral attaching portion 88 extends generally downward from the heel
- 20 securing portion 80 and the lateral instep securing portion 84. The medial attaching portion 86 is operatively connected to the medial wing portion 68 of the sole stiffening member 28. The lateral attaching portion 88 is operatively connected to the lateral wing portion 66 of the sole stiffening member 28. In the embodiment shown in Fig. 7, the

securing system is a thermoplastic polyurethane. It could also be leather, synthetic leather, reinforced mesh, or any other suitable material. The securing system could also be integrally formed with the sole stiffening member. An alternative configuration of the sole stiffening member 128 and securing system 130 is shown in Fig. 10. The sole stiffening member and securing system are a single unitary piece of a monolithic construction.

In use, the shoe is preferably placed on a wearer's foot by moving the closure system to a loosened condition. In a loosened condition, the medial and lateral closure portions 54 and 56 are moved apart from each other a sufficient distance to allow the wearer's foot to slide into the shoe. The shoe is then secured by placing the closure system in a tensioned condition from this loosened condition by moving the upper medial portion 48 towards the upper lateral portion 50. As the upper medial portion 48 moves towards the upper lateral portion 50, the shoe firmly holds the wearer's foot, particularly in a region of the foot adjacent the medial and lateral closure portions 48 and 50. The closure system 32 is maintained in this tensioned condition. In the embodiment shown, the shoelace of the closure portion is tied in a knot to maintain the closure system in a tensioned condition.

The sole stiffening member 28 is adapted to provide both static and dynamic support in a shank area of the shoe. The shank area of the shoe is the area of the shoe between where the heel and the ball of the foot contact the shoe. The sole stiffening member provides static support as a person stands on the shoe compressing a portion of the shoe under the foot. The compression of the shoe compacts a portion of the midsole and moves the connecting portion relatively downward. As shown by the

arrows in Fig. 9, the downward movement of the connecting portion is translated in a generally forward direction to the forefoot engageable portion and in a generally rearward direction to the heel engageable portion. The resilient nature of the midsole, outsole, and sole stiffening member causes the compressed portion of the midsole to expand and the sole stiffening member to move relatively upward when the shoe is unloaded (i.e. when the person removes his weight from the shoe).

The sole stiffening member provides dynamic support as a person walks or runs. The sole stiffening member remains generally rigid when loaded in a longitudinal direction. By linking a heel region and a forefoot region of the shoe, the sole stiffening member can translate forces from one to the other as a result of this longitudinal rigidity. As the heel strikes the ground and the person transfers weight on to that foot, the sole stiffening member transitions some of the resulting forces into the forefoot portion of the shoe. This force transition improves the gait cycle.

In addition to the support described above the sole stiffening member provides increased durability to the shoe. The action of walking or running causes the shoe to bend as the heel is lifted from the ground while the ball of the foot remains in contact with the ground. In a shoe without a sole stiffening member this cyclical bending stretches a portion of the midsole bottom surface. The repeated stretching of the midsole diminishes the resiliency of the midsole until the shoe is no longer comfortable to wear. As described above the sole stiffening member is made of a thermoplastic polyurethane material. This material will bend and is difficult to stretch. As a result the sole stiffening member bends rather than stretches during use. The bending of the sole stiffening member causes a portion of the midsole to be

compressed in the region of the bending and reduces the amount of stretching in the region of the bending (as compared to bending the shoe without the sole stiffening member). This reduction of the midsole stretching increases the period of time it takes to reduce the resiliency of the midsole and thus increases the durability of the shoe.

5           In addition to the support and durability functions described above, the sole stiffening member 28 is adapted to operatively connect to the securing system 32. The integration into the securing system allows an additional means for preventing relative movement between the shoe and the wearer's foot. In the embodiment shown, the medial instep securing portion 82 has an opening 90 that aligns with an eyelet of the

10   medial closure portion 54 of the closure system and the lateral instep securing portion 84 has an opening 92 that aligns with an eyelet of the lateral closure portion 56 of the closure portion. The shoelace is threaded through the medial and lateral instep securing openings 90 and 92. When the closure system is placed in the tensioned condition the medial and lateral instep securing portions 82 and 84 are drawn toward

15   each other placing the securing system 30 and the sole stiffening member in tension. In this state, the securing system 30 and the sole stiffening member 28 squeeze the shoe such that a portion of the midsole and a portion of the upper heel portion are moved towards a wearer's foot. This compresses a portion of the shoe between the wearer's foot and the sole stiffening member 28 and the securing system 30. Securing forces

20   are generated by the sole stiffening member 28 and the securing system 30. The securing forces are directed towards the wearer's foot.

As various changes could be made in the above constructions and methods without departing from the scope of the invention, it is intended that all matter contained

in the above description or shown in the accompanying drawings shall be interpreted as illustrative and not in a limiting sense. Thus, the breadth and scope of the present invention should not be limited by any of the above-described exemplary embodiments, but should be defined only in accordance with the following claims appended hereto and  
5 their equivalents.